

A new species of caracara (*Milvago*) from Quaternary asphalt deposits in Cuba, with notes on new material of *Caracara creightoni* Brodkorb (Aves: Falconidae)

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Abstract.—An extinct caracara, *Milvago carbo*, new species, is described from Quaternary asphalt deposits of Las Breas de San Felipe, northern Matanzas Province, Cuba, from tarsometatarsi, tibiotarsi, and a notarium. This species was much larger than other species of the genus, living or extinct. New material of the extinct species *Caracara creightoni* provides additional information on its characters and distribution.

Resumen.—Se describe una nueva especie de caracara, *Milvago carbo*, sobre la base de tarsometatarsos, tibiotarsos, y un notarium, procedentes de Las Breas de San Felipe (depósitos cuaternarios de asfalto), al norte de la provincia de Matanzas, Cuba. Esta especie era mayor que las demás conocidas del género, vivientes o extinguidas. Nuevo material de la especie extinta *Caracara creightoni* suministra información adicional sobre sus caracteres y distribución.

The caracaras (Caracarinae = Polyborinae auct.) comprise 10 species of mainly terrestrial Falconidae found throughout the Neotropics and in southern Florida and in temperate southern South America. The larger species are at least partly scavengers with somewhat vulture-like habits. The only living representative of the group in the West Indies is the widespread Crested Caracara, *Caracara cheriway* Jacquin, found in Cuba and the Isle of Pines (now Isla de la Juventud) (American Ornithologists' Union 1998, Raffaele et al. 1998). The Cuban populations cannot be distinguished from those of the mainland and are thought to result from a relatively recent colonization of the island (Suárez and Olson 2001).

Despite their modern paucity, the fossil record indicates that caracaras were much more diverse in the West Indies in the Quaternary. *Caracara creightoni* Brodkorb (1959b) is known from the Quaternary of

New Providence Island, Bahamas (Olson and Hilgartner 1982), and of Cuba (Suárez and Olson 2001). *Caracara latebrosus* Wetmore (1920) from Puerto Rico is enigmatic as it is known so far only from two bones that are not particularly diagnostic (Olson 1976). A caracara from Grand Cayman reported as *C. creightoni* (Morgan 1994), is too large for that species but smaller than a very large, nearly flightless caracara discovered on Jamaica (Olson, unpublished data).

Smaller caracaras of the genus *Milvago* have hitherto been known in the West Indies only from Hispaniola, home to *Milvago alexandri* Olson (1976), a species about the size of the living *M. chimachima*. The latter species, essentially South American in distribution, expanded into southern Costa Rica from Panama about 1973 (Stiles and Skutch 1989), but probably once occurred throughout Middle America and southern North America because it is known from the Pleistocene of Florida. The Florida fos-

sils were originally described as *Falco readei* Brodkorb (1959a), which was transferred to *Milvago* by Campbell (1980), and then synonymized with *M. chimachima* by Emslie (1998). Fossils of *Milvago* of about this size have also been recovered from Cuba (Suárez and Arredondo 1997), but those known so far are too incomplete to be diagnostic at the specific level (Suárez and Olson, pers. obs.).

During the processing of bird fossils from asphalt deposits of Las Breas de San Felipe, northern Matanzas Province, Cuba (see Iturralde-Vinent et al. 2000), new evidence of yet another species of caracara came to light. Although of relatively large size, this species is nevertheless referable to the genus *Milvago*. We also report previously unknown skeletal elements of *Caracara creightoni* from additional localities in Cuba.

Methods and comparative material examined.—Measurements were taken with digital calipers to the nearest 0.1 mm. Osteological terminology follows Howard (1929) and Baumel and Witmer (1993). Skeletons of Caracarinae examined at the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM), include the following species: *Milvago chimango* (7), *M. chimachima* (8), *Daptrius ater* (5), *D. americanus* (2), *Phalcoboenus australis* (5), *P. carunculatus* (1), *P. megalopterus* (1), *Caracara plancus* (7), *C. cheriway* (12), and *C. lutosa* (1). Fossil specimens examined included: *Milvago alexandri*, holotypical right tarsometatarsus USNM 214573, Haiti, Hispaniola; *Milvago* sp., proximal end of left tarsometatarsus, collection of William Suárez, La Habana, Cuba (WS 977); *Caracara creightoni*, distal end of right tibiotarsus lacking posterior rim of internal condyle, Museo Polivalente de Sagüa La Grande, Villa Clara, Cuba (MPSG 83), complete left tarsometatarsus MPSG 103, and distal half of left tarsometatarsus MPSG 106, Cuba. The description and illustrations of the extinct caracara

Milvago brodkorbi Campbell (1979), of Peru, were also used for comparison.

Systematics

Class Aves

Family Falconidae

Fossils were referred to the Falconidae instead of Accipitridae by the characteristic three openings on the distal portion of the tibiotarsus; tarsometatarsus with medial calcaneal ridge of the hypotarsus longer and centrally placed rather than short and medial. Referral to the subfamily Caracarinae instead of Falconinae is indicated by the short hypotarsus, with an abruptly truncate distal margin, rather than being long and tapering gradually down the shaft as in the Falconinae.

Genus *Milvago* Spix, 1826

The new species is referred to *Milvago* rather than to *Caracara*, *Daptrius*, or *Phalcoboenus* by having the tarsometatarsus very slender, trochlea for digit 2 broad at base, rotated slightly posteriad and with posterior wing straight, projecting posteriorly perpendicular to the main axis of the shaft (see Campbell 1980).

***Milvago carbo*, new species**

(Fig. 1)

Holotype.—Nearly complete right tarsometatarsus, Museo Nacional de Historia Natural, La Habana, Cuba (MNHNCu P4569), lacking most of the posterior edge of the medial calcaneal ridge and part of the outer cotyla. Collected by members of the Geology and Paleontology Group of the MNHNCu, during field expeditions in 1998.

Type locality and age.—Cuba, Matanzas Province, Municipality of Martí, 5.5 km west of the town of Martí, asphalt deposit known as Las Breas de San Felipe, San Felipe II site (Instituto Cubano de Geodesia y Cartografía 1986, 1:50,000 map, sheet Martí 4084-IV, X502, Y347). Quaternary, prob-

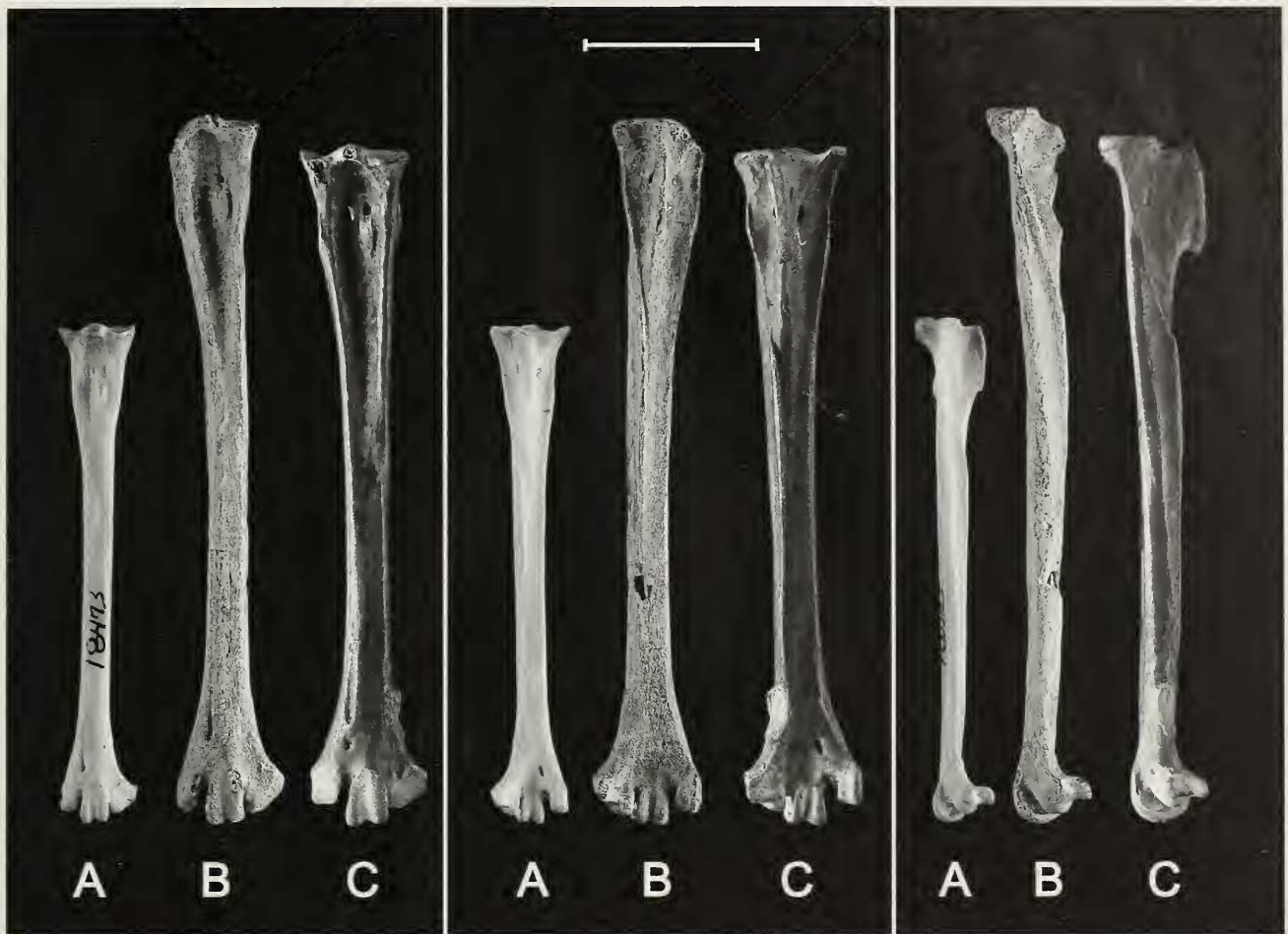


Fig. 1. Tarsometatarsi in anterior, posterior, and medial views: A, *Milvago chimango* (USNM 18473); B, *Milvago carbo*, new species, holotype, MNHNCu P4569 (specimen coated to enhance photography); C, *Caracara creightoni* MPSG 103 (image reversed to facilitate comparison). Scale = 2 cm.

ably late Pleistocene or early Holocene; not directly dated (for description, associated fauna, and discussion of the age of the deposit, see Iturralde-Vinent et al. 2000).

Measurements (mm) of holotype.—Total length, 85.7; least width and depth of shaft, 4.5×3.6 ; distal breadth, 3.0; width and depth of trochlea for digit 3, 4.6×6.1 .

Topotypical paratypes.—Fragmentary notarium MNHNCu P4567; distal ends of left tibiotarsi MNHNCu P4568, MNHNCu P4570, MNHNCu P4571; proximal half of left tarsometatarsus lacking part of the medial and lateral calcaneal ridges MNHNCu P4572; shaft of left tarsometatarsus MNHNCu P4573; proximal right tarsometatarsus MNHNCu P4574; distal halves of right tarsometatarsi MNHNCu P4575, MNHNCu P4576 (abraded); distal ends of left tarsometatarsi MNHNCu P4577, MNHNCu P4578.

Etymology.—*L. carbo*, charcoal, coal, from the black color of the tar-impregnated fossils.

Diagnosis.—Much larger than any other species of the genus *Milvago* living or extinct (Table 1).

Description.—Notarium large, slender and laterally compressed (smaller, relatively shorter but also compressed in *Milvago chimachima* and *M. chimango*). Although the tibiotarsus is large, no qualitative characters could be discerned, as this element shows great intraspecific variation in *Milvago* (Emslie 1998). Tarsometatarsus large with the flattened medial (inner) surface angled towards the midline of the posterior face so that the posterior crest that it forms is near the midline and nearly continuous with the medial calcaneal ridge, and the posterior metatarsal groove is narrow, as in *M. chimango*, and as opposed to *M. chimachima*,

Table 1.—Skeletal measurements (mm) of fossil and living species of *Mitvago*. Sequence is: range (mean) n.

Measurement	<i>M. carbo</i>	<i>M. alexandri*</i>	<i>M. brodkorbi**</i>	<i>M. chimachima***</i>	<i>M. chimango***</i>
Notarium					
Total length	33.7	—	—	24.4–25.9 (24.9) 3	22.1–27.2 (24.7) 7
Tibiotarsus					
Distal width	10.6–11.2 (10.8) 3	—	8.2–9.9 (9.1) 23	7.5–8.9 (8.3) 8	7.1–9.5 (7.8) 9
Tarsometatarsus					
Length	85.7	56.2	57.9–61.8 (59.8) 5	50.0–54.2 (51.8) 8	56.8–63.8 (59.7) 9
Proximal width	11.3–11.6 (11.4) 2	8.2	9.4–10.9 (10.0) 9	8.5–9.5 (8.8) 8	7.9–10.1 (8.5) 9
Least width of shaft	4.5 (4.5) 3	3.4	3.6–4.4 (4.0) 15	3.2–3.7 (3.5) 8	2.9–3.8 (3.2) 9
Least depth of shaft	3.4–3.6 (3.4) 4	2.6	—	2.3–2.7 (2.5) 8	2.2–2.7 (2.4) 9
Distal width	12.2–13.0 (12.5) 3	9.1	9.1–10.4 (9.7) 14	8.2–10.0 (8.7) 8	8.2–10.2 (8.8) 9
Width of trochlea for digit 3	3.9–4.6 (4.2) 3	3.4	3.4–4.1 (3.7) 19	3.2–3.8 (3.3) 8	3.0–3.7 (3.2) 9
Depth of trochlea for digit 3	5.2–6.1 (5.6) 3	—	—	3.7–4.5 (4.1) 8	3.4–4.2 (3.7) 9

Measurements from Olson (1976)*, Campbell (1979)** and Emslie (1998)***.

M. alexandri, and *M. brodkorbi*, in which the posterior crest is offset medially and the groove is wider. The roughly triangular excavation lying medial and distal to the hypotarsus is short in *M. carbo* and *M. chimango*, and longer, extending farther down the shaft in *M. chimachima*, *M. alexandri*, and *M. brodkorbi*. Trochlea for digit 2 very wide and very excavated medially in posterior view, in this respect resembling the species of *Phalcoboenus*. Distal foramen high, more proximal on the shaft (similar to *M. chimachima* and *M. alexandri*, as opposed to the more distal placement in *M. chimango*, and *M. brodkorbi*).

Remarks.—The much greater diversity of the family Falconidae in the Quaternary of the West Indies than at present is again increased with the addition of *Milvago carbo*. This is the second fossil species of *Milvago* known in the Greater Antilles, and the third overall. *Milvago brodkorbi* Campbell (1979), from the Talara Tar Seeps, Peru, is larger than *M. alexandri* Olson (1976) of Hispaniola, but both would have been dwarfed by *M. carbo*.

The Cuban species *Milvago carbo* and *Falco kurochkini* Suárez and Olson (2001), the latter of the subfamily Falconinae, agree in the marked elongation of the tarsometatarsus. Of the two living species of *Milvago*, *M. chimango*, which ranges from southern Brazil and Chile south to Tierra del Fuego, has a long and slender tarsometatarsus and occurs in open country, whereas *M. chimachima*, which ranges from Panama and Costa Rica southward east of the Andes to northern Argentina, has a shorter tarsometatarsus and is more arboreal in habits (Vuilleumier 1970). From its size and the proportions of its tarsometatarsus, *M. brodkorbi* appears to be a trans-Andean representative of *M. chimango*.

Milvago carbo would probably have been at least as terrestrial in habits as *M. chimango* or *M. brodkorbi* but was much larger. The total length of its tarsometatarsus is between that of *Caracara creightoni* (smaller) and *C. cheriway* (larger), but be-

cause it is much more gracile, *M. carbo* probably took smaller prey than either.

Genus *Caracara* Merrem, 1826
Caracara creightoni Brodkorb, 1959
 (Fig. 2; Table 2)

Referred material.—Las Breas de San Felipe II, municipality of Martí, Matanzas: fragmentary anterior half of notarium MNHNCu P4579, 4 distal ends of left MNHNCu P4580–83 and two distal ends of right tibiotarsi MNHNCu P4584–85, 6 distal ends of right MNHNCu P4586–91 and two distal ends of left tarsometatarsi MNHNCu P4592–93. Cueva de Paredones, about 3 km SE of Ceiba del Agua, municipality of Caimito, La Habana: complete left femur WS 1933. Cueva de Sandoval, about 4 km south of Vereda Nueva, municipality of Caimito, La Habana: proximal end of right humerus WS 1035 and proximal end of right femur WS 587.

Comparisons with other species of Caracara.—The fragment of notarium agrees with *Caracara* in the less laterally compressed anterior vertebrae, unlike *Milvago*, in which these vertebrae are greatly compressed and thin anteriorly. It differs from *C. plancus*, *C. cheriway*, and *C. lutosa* in its relatively small size and by the lower position of the foveae costales. The proximal end of the humerus is smaller with a capital groove that is thin, rather than wide as in *Milvago*. The femur is similar to that in the species of *Caracara*, but differs specifically from *C. plancus*, *C. cheriway*, or *C. lutosa* in being smaller, with a very thin shaft at the midpoint and relatively wide proximal and distal ends (Table 2). The head of the femur is not reflected proximally; the pneumatic foramen is large; the external condyle is thin and more vertical; and the intercondylar sulcus is wider. Thus this specimen agrees with two portions of femora recorded by Suárez and Arredondo (1997) as *C. creightoni*, but not further described by Suárez and Olson (2001) because of their fragmentary condition.

The additional tarsometatarsi of *C.*



Fig. 2. Left femora (A, B) and right humeri (C, D) of *Caracara*: A, *C. creightoni* WS 1933; B, *C. cheriway* USNM 19670; C, *C. creightoni* WS 1035; D, *C. cheriway* USNM 19670. Scale = 2 cm.

creightoni from Las Breas de San Felipe indicate points of distinction not previously mentioned by Suárez and Olson (2001): the trochlea for digit 2 is reduced and not rotated posteriad, as opposed to being larger

and more posteriorly rotated in *Caracara plancus*, *C. cheriway*, and *C. lutosa*. This character is present in all specimens available and does not represent intraspecific variation as we first supposed.

Table 2.—Measurements (mm) of the humerus and femur in fossil and living species of *Caracara*. Sequence is: range (mean) n.

Measurement	<i>C. creightoni</i>	<i>C. cheriway</i>	<i>C. plancus</i>	<i>C. lutosa</i>
Humerus				
Depth of the head	5.7	5.9–7.2 (6.7) 13	6.0–8.8 (7.1) 7	7.0
Least width of shaft	7.1	7.3–8.3 (7.7) 12	7.4–9.8 (8.3) 7	8.4
Femur				
Length	65.6	68.4–76.8 (72.0) 12	66.1–80.8 (73.6) 7	71.1
Proximal breadth	13.7, 14.4	13.2–15.2 (14.3) 12	13.2–18.5 (15.4) 7	14.8
Least width of shaft	6.2	6.8–8.2 (7.5) 12	6.9–8.8 (7.6) 7	7.5
Least depth of shaft	5.8	6.2–7.4 (6.9) 12	5.9–8.4 (7.0) 7	7.0
Distal breadth	13.7	13.4–16.4 (15.0) 12	13.7–18.4 (15.7) 7	16.0

Remarks.—Remains of *Caracara creightoni* occurred together with *Milvago carbo* at Las Breas de San Felipe in a small area of less than 2 m² (Suárez, pers. obs.). Although fossils of all known extinct Cuban scavenging birds occur at Las Breas, no remains of *Caracara cheriway* have been found there (Suárez, in prep.). The distal end of a left tarsometatarsus from a cave deposit in La Habana Province that Jiménez (1997) recorded as *Caracara plancus* (= *cheriway*), was re-examined (WS) and found to agree with *C. creightoni* instead. Possibly *C. cheriway* reached Cuba after Europeans introduced domestic animals that provided similar ecological conditions to those that may have been lost following the extinction of most of the large endemic mammals of the West Indies at the end of the Pleistocene and early in the Holocene.

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